DEMOGRAPHIC RESEARCH
A peer-reviewed, open-access journal of population sciences

DEMOGRAPHIC RESEARCH

VOLUME 43, ARTICLE 8, PAGES 183–216
PUBLISHED 24 JULY 2020
http://www.demographic-research.org/Volumes/Vol43/8/
DOI: 10.4054/DemRes.2020.43.8

Research Article

Life-course and cohort effects on Chinese parents' investments in their children

Jinye Shi

Bing Xu

Yi Wei

This publication is part of the Special Collection on Life-Course Decisions of Families in China, organized by Guest Editors Bing Xu, William A.V. Clark, Eric Fong, and Li Gan.

Contents

Demographic Research: Volume 43, Article 8
Research Article

Life-course and cohort effects on Chinese parents' investments in their children

Jinye Shi[1]
Bing Xu[1,2]
Yi Wei[3]

Abstract

BACKGROUND
How parents' age at the birth of their children (age at parity) affects their investments in the children has not been explored previously.

OBJECTIVE
We examine the effect of parents' age at parity on the investments in their children by disentangling the overall effect into life-course effect and cohort effect.

METHODS
Using the 2017 wave of the Chinese Household Finance Survey, we conduct a cross-sectional regression analysis to separately estimate the life-course effect and the cohort effect.

RESULTS
We find a positive relationship between parents' age at parity and investments in their children and a negative relationship between parents' current age and investments. We also find a negative relationship between investments and parents' age interacted with their age at parity.

CONCLUSION
Parents who gave birth at an older age and those from a younger cohort on average invest more in their children, both financially and in time. Older parents spending more on their children suggests that financial constraints may be another channel, in addition to a biological one, through which having a child at a later age limits total fertility.

[1] Research Institute of Economics and Management, Southwestern University of Finance and Economics, Sichuan, China.
[2] Corresponding author. Email: xubing@swufe.edu.cn.
[3] China Institute for Educational Finance Research, Peking University, Beijing, China.

CONTRIBUTION

Delay in age at parity and increase in parental investment in children are two prominent social phenomena in many parts of the world. The positive link we find between them suggests that these phenomena, which are often cited as important contributors to the decline in the total fertility rate in many nations, may be reinforcing each other.

1. Introduction

The relationship between parents and children is one of the most important social ties within a family. The strength of this relationship is reflected in many ways, one of which is investments parents make, in both time and money, in their children. Aside from the expenses needed to maintain a child's physical well-being, the most significant part of parents' expenditure on their children may be the spending on education, as education is the principal means by which capital is transferred across generations (Allat 1993; Bourdieuand and Passeron 1977; Martens et al. 2004). This is particularly true in China, where households spend 14.3% of their total expenditure on children's pre-tertiary education (CIEFR-HS 2017), in contrast to U.S. families, which spend only 5% (Schroeder et al. 2015). Thus, it is crucial to understand the factors that affect parents' investments in their children. The existing literature has found that, as expected, positive socioeconomic characteristics of parents contribute positively to investments in the children (Brown 2006; Hao and Yeung 2015). In particular, children from higher-income families have higher probabilities of enrolling in colleges, which establishes a causal link between parents' economic status and higher investments in their children's education (Acemoglu and Pischke 2001; Carneiro and Heckman 2002; Loken 2010). Zhang (2016) examined a sample of families from Jinan[4] and found that parents' education levels and professions positively affect their children's use of private tutoring classes. In addition, the level of parental investments has been shown to depend on children's characteristics as well. For example, male children in China receive greater educational investments compare to their female counterparts (Bian 1996).

In contrast to the earlier works, we approach parents' investment behavior from a life-course perspective. We examine how the circumstances of parents' earlier life-course events, specifically their age when their children were born, which we call the age at parity, affect their current investment behavior. Although casual observations indicate that older parents tend to spoil their children, such a life-course effect on parents' actual educational spending or time investments in their children has not been

[4] Jinan is the capital city of China's Shandong Province.

studied rigorously. The few papers that touch on this issue do so only tangentially. For example, Hamilton, Cheng, and Powell (2007) and Lee (2008) included parents' age as a control variable in their regression of parenting behavior and incidentally found that a mother's age has a positive effect on the amount of investment in children. Price (2008) showed that when both parents' ages are controlled for, the age of the firstborn child has a sizable negative effect on the parents' quality time spent with the children, which means parents who have their first child later in life spend more quality time with their children.

In our study, the effects of the age at parity are the main interest. We find that among parents with similarly aged children, older age at parity is associated with greater investments, both financially and in time, in the children. At a first glance, it may not seem surprising to observe those who became parents at a later age investing more in their children, especially in light of the previous studies. After all, they have had more years to accumulate wealth and are more likely to be in a stable phase in their careers and earning a higher income.[5] Our results, however, show that the positive relationship between the age at parity and investments in children remains even after controlling for parents' income and education levels. Therefore, becoming parents at a later age appears to have an inherent tendency, beyond simply financial ability, to induce greater investments in the children. As we discuss below, this result may have an important implication for total fertility.

As in many parts of the world, low fertility is becoming a major concern in China. While the one-child policy makes China's fertility experience unique, China also has many of the same causes for low fertility as the rest of the world. In particular, delay in the age at first parity is one important contributor to low total fertility in many nations, as there is a biological age constraint on the ability to conceive. In China, delay in the entry into motherhood is partly state-engineered. Starting in the early 1970s, China heavily encouraged "later marriage and later fertility" to reduce population growth, raising the legal age of marriage to 22 for men and 20 for women in 1980. However, similar to many developed nations,[6] rising educational attainment by women also contributed to delaying marriage and parity.[7] Another often cited cause for low fertility, particularly in East Asia, is the financial constraint imposed by heavy investments parents make in their children's education in response to the intense competitive pressure (Anderson and Kohler 2013; Choe and Retherford 2009; Gauthier 2016; Jones and Hamid 2015; Xu and Pak 2019). The results of this paper show that these two important contributors to low fertility are not independent but positively related, which

[5] For example, according to the compensation research firm PayScale, the peak salary occurs at age 40 for women and at age 49 for men in the United States (Elkins 2017).
[6] See, for example, Lappegård (2000) and Geiger et al. (2019).
[7] According to World Bank data, tertiary education for women in China increased from less than 1% in 1978 to above 50% in 2017.

raises the possibility that the two may reinforce each other's tendency to lower total fertility. That is, delay in parity lowers the likelihood of parents having another child through the biological constraint. In addition, since this leads them to make greater financial and time investments in the child, even after adjusting for their income, it may leave them with fewer resources for having another child, further lowering its likelihood.

In many demographic studies, cohort effects are often confounded with life-course effects. That is, if parents at different ages have different parenting behaviors, it is often difficult to identify whether it is the cohort effect (different life experiences) or the life-course effect (simply being at different ages), or both, that is driving the difference. In this paper, we would have been able to untangle these two effects in an ideal manner if a child's age could be included in the estimation. However, because this would result in perfect colinearity, we include the child's school-stage instead. Although we lose some precision, this allows us to separate the two effects and examine whether "parenting styles," as defined by the degree of financial and time investments in children, have changed in China over the last 30 years, during which China has undergone a dramatic social and economic transformation. Our results show that parents from younger cohorts invest more in time and money in their children. This is in line with Sayer et al. (2004), who found that younger parents in Europe and North America spend more time with their children compared to older cohorts, and suggests that economic and social modernization may be changing the image of a "standard parent" in China toward the Western norm.

2. Data and model specification

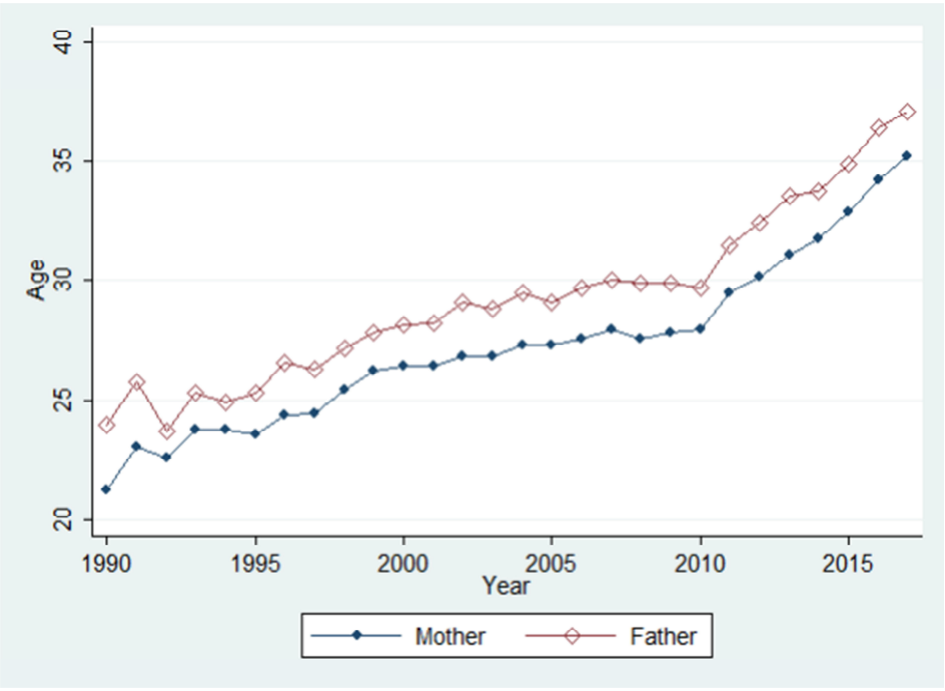
2.1 Data

To examine the life-course and the cohort effects, the two potential pathways through which parents' age at parity is related to the investments in their children's education and their time involvements with the children, we use data from the latest round of the China Household Finance Survey (CHFS). The CHFS is a nationally representative survey that collects detailed information on financial conditions and demographic characteristics of Chinese households. Since its inception, four waves of surveys have been conducted, during the summers of 2011, 2013, 2015, and 2017. The 2017 wave covers 363 counties, representing all the provincial administrative regions of mainland China except Tibet and Xinjiang, and contains data for 40,011 households and their 127,012 members. The 2017 survey is the first CHFS survey to collect information on households' educational spending, in particular for household members under age 16

and those above age 16 but still in school. It also collected time-use information for all 30,591 members from a subsample of 12,471 households.

This paper restricts attention to urban households for the following reasons. First, there is a substantial difference in the amount of educational spending between urban and rural households. As shown in Table 1, the average annual spending of an urban household for a child in elementary, middle, and high school is roughly 13,000 RMB, 15,000 RMB, and 22,000 RMB, respectively. In contrast, the corresponding numbers of rural households are only 5,000 RMB, 7,000 RMB, and 14,000 RMB. Second, the composition of the spending is also significantly different. Rural households on average spend about 85% of their total educational expenditure on in-school expenses, while a large portion of urban households' educational expenditure, about 45%, is spent on out-of-school activities, such as private tutoring and recreational lessons. Given that rural households spend substantially less on children's education than urban households and that a large portion of their expenses is on in-school activities, which are mostly mandatory, the rapid rise in educational spending appears to be mainly an urban phenomenon. Thus, the data for our study consists of 5,373 urban households that had at least one child in grades K through 12. If a household had more than one child in K–12, the survey collected information regarding educational expenses for only one of the children, whom we refer to as the representative child. The representative child may or may not be the firstborn child. The descriptive statistics for our data are given in Tables 2–5 and Figure 1.

Figure 1: Upward trend in the average age at parity between 1990 and 2017



As Table 2 shows, 12.42% of the households in our sample are from urban areas of the first-tier cities, 35.64% are from urban areas of the second-tier cities, and 51.94% are from urban areas of the remaining cities.[8] Among the 5,373 households, 57.81% have only one child, 37.35% have two children, and 4.84% have more than two. Around 18.94% of the households have at least one parent with a bachelor's or a higher degree. Among the representative children, 53.49% are male and 18.39% are not firstborns. The percentage of the children in elementary school, middle school, and high school is 54.33%, 26.17%, and 19.50%, respectively. Figure 1 plots the average age of the parents at their representative child's birth against the year in which they gave birth. As the figure shows, there was a dramatic increase in parents' age at parity between 1990 and 2017. The average age for women rose from 21.3 to 35.2, while men's

[8] Cities in China are ranked based on their population size, economic development, services, infrastructure, and cosmopolitan nature. According to the ranking, Beijing, Guangzhou, Shanghai, and Shenzhen are first-tier cities, while Changchun, Changsha, Chengdu, Chongqing, Fuzhou, Guiyang, Haerbin, Haikou,, Hangzhou, Hefei, Huhehaote, Jinan, Kunming, Lanzhou, Nanchang, Nanjing, Nanning, Qingdao, Shenyang, Shijiazhuang, Taiyuan, Tianjin, Wuhan, Xian, Yinchuan, and Zhengzhou are second-tier cities.

average age increased from 24.0 to 37.1. Although some of the acceleration in the upward trend since 2011 may be coming from more parents having a second child as a result of the relaxation in the one-child policy, the increase in the age at parity seen during the 1990 to 2010 period, from 21.3 to 28.0 for mothers and from 24.0 to 29.7 for fathers, still remains significant. Moreover, the increases observed in China are much larger and faster than the changes in other countries.[9] Table 3 describes the distribution of parents' birth years and their ages at parity. The birth years of both mothers and fathers range from the 1960s to the 1990s. Thus, more than 30 years of time span is available for investigating the cohort effect on the financial and time investments in children. The age at parity ranges from below 25 to over 45, which provides the variation needed for studying the life-course effect on investments in children.

Table 4 documents the steady decline in households' educational expenses across parents' age cohorts, from around 18,300 RMB for households with parents born between 1970 and 1974 to around 5,400 RMB for households with parents born after 1990, as well as large variations in expenses for all cohorts. However, as we discuss below, the observed correlation between a parent's age and educational spending may not reflect the true cohort effect and instead may be confounded with the effect of their child's stage in the K–12 education system (hereafter called school-stage) since parents from younger cohorts are more likely to have children in lower school-stages, which is associated with lower educational cost, as shown Table 1. The lower panel of Table 4 gives the relationship between parents' age at parity and educational expenses. As the panel shows, parents who gave birth between age 25 and age 34 spent the most on their children's education. It may be somewhat surprising to see parents who gave birth after age 35 spending less than parents who gave birth at a younger age. One explanation for this is that the representative child of a parent whose age at parity is older than 35 is less likely to be the first child. Thus, if a parent's educational spending is related to the child's birth order, it may result in apparent lower spending. Compared to the educational spending, both the correlation between parents' age at parity and the time spent with their children and the correlation between their age cohort and the time spent with the children present different patterns. As Table 5 shows, parents from younger cohorts tend to spend more time with their children, but no clear trend is found with respect to parents' age at parity.

[9] For example, the average age at parity for mothers in the United States also increased from 2000 to 2014 for all birth orders. However, the average age for first births, which had the largest increase, rose from 24.9 to only 26.3 (Mathews and Hamilton 2016).

2.2 Model specification

Parenting behaviors, such as educational spending and time spent with their children, depend substantially on the age of the children since children's needs vary significantly with age. Therefore, parenting behaviors should be compared across parents with similarly aged children. Even among parents with children of similar ages, though, older parents may behave differently than younger parents because they are from an older cohort (cohort effect) or because they were at a different stage in their lives when they had their children (life-course effect). To disentangle the cohort and the life-course effects, ideally we would like to use children's age to control for the level of their needs and use parents' age to capture the cohort information and age at parity to indicate the life-course stage. However, a child's age, the parent's age, and the parent's age at parity are perfectly colinear and cannot be used simultaneously in a regression analysis. Thus, we loosen the measure of one of the three variables slightly, in a way that preserves most of the information while avoiding the multi-colinearity problem. In particular, since the main interest of this study is the cohort and the life-course effects on parenting behaviors, and children's age is mainly used as a control for their needs, we maintain parents' age and age at parity and use children's school-stage instead of their age to represent children's needs.

The following is the baseline model for the regression analysis of parents' financial spending on their children's education.

$$\begin{aligned}\ln(Edu.Exp._i) = {} & \beta_0 + \beta_1 * (parent's\ age)_i + \beta_2 * (parent's\ age\ at\ parity)_i \\ & + (other\ characteristics\ of\ parent)_i * \alpha \\ & + (characteristics\ of\ child)_i * \theta \\ & + (characteristics\ of\ household)_i * \gamma \\ & + (citytiers)_i * \delta + (province)_i * \eta + \varepsilon_i, \end{aligned} \quad (1)$$

where $\ln(Edu.Exp._i)$ is the natural log of the educational expenses of household i.[10] Variables in other *characteristics of parent* include the age difference between the father and the mother, whether the parent has a bachelor's or a higher degree, and whether the parent has a job. *Characteristics of child* is a vector of demographic variables for the representative child and consists of gender, school-stage, and whether the child is a firstborn. Variables in *characteristics of household* include the number of children in the household, and the income and wealth levels. Variables *citytiers* and *province* are the geographic indicator variables.

[10] There were 36 households (out of 5,373 households) that reported zero as their total educational expense. We replaced zero with 1 RMB before taking the natural logarithm to avoid dropping these households from our analysis.

In our sample, about 14% of the mothers and 29% of the fathers reported spending zero minutes with their children. The maximum time spent by parents with their children was around 1,100 minutes, which is consistent with the common perception that parents do not spend every minute of a day with their children. Therefore, the data is censored at zero but effectively not bounded from above. Thus, we use the Tobit model, which is a standard regression model for dealing with censored dependent variables, to consistently estimate the life-course and the cohort effects on parents' time investment in their children. The Tobit model is specified as follow:

$$\begin{cases} Time_i^* = \beta_0 + \beta_1 * (parent's\ age)_i + \beta_2 * (parent's\ age\ at\ parity)_i \\ \qquad\qquad +(time\ spouse\ spent\ with\ child)_i * \alpha \\ \qquad\qquad +(other\ characteristics\ of\ parent)_i * \alpha_1 \\ \qquad\qquad +(characteristics\ of\ child)_i * \theta \\ \qquad\qquad +(characteristics\ of\ household)_i * \gamma \\ \qquad\qquad +(citytiers)_i * \delta + (province)_i * \eta + \varepsilon_i \\ Time_i = Time_i^* \qquad \text{if } Time_i^* > 0 \\ Time_i = 0 \qquad\qquad \text{if } Time_i^* \leq 0, \end{cases} \tag{2}$$

where $Time_i^*$ is the latent variable and $Time_i$ is its observed counterpart. The latent variable $Time_i^*$ is assumed to be linearly correlated with a vector of explanatory variables, which have the same interpretations as in specification (1), and ε_i is the normally and independently distributed error term with zero mean and constant variance.

3. Results

Table 6 presents the OLS estimates of the baseline model, where specification 1 uses the mother's current age and age at parity for *parent's age* and *age at parity* and specification 2 uses those of the father. Since the two specifications yield similar results, we base our interpretation of the regression results on the estimates obtained from specification 1.[11] Conditioned on the characteristics of the parents, the household, and the representative child, a mother's age is negatively and substantially related to the monetary spending on her child's education, while her age at parity is related to the spending positively. To be more precise, one-year increase in the mother's age is

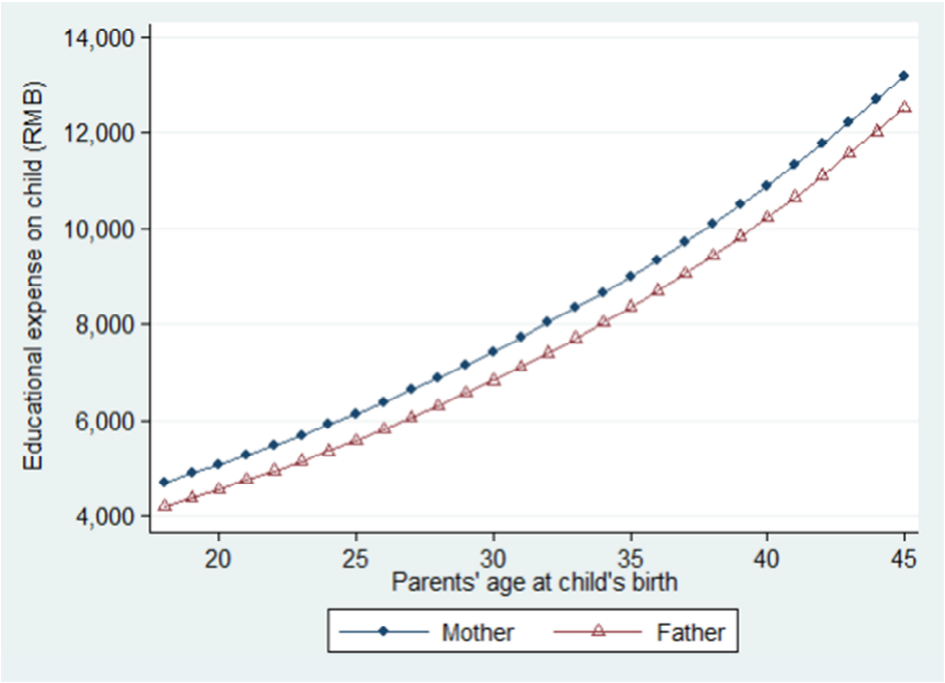
[11] Further regression analyses also mainly use mothers' age information to examine the effects of parents' ages and ages at parity on financial and time investments in their children.

associated with about a 3.23% decrease in the educational spending, whereas a one-year increase in the age at parity leads to a 3.81% rise in the spending.

As Ryder (1965) notes, individuals from different age cohorts have distinct characteristics, which reflect the unique circumstances of their entry in the social world and subsequent age-graded exposure to social conditions and cultural transformations. The birth years of parents in our sample range from the 1960s to the 1990s, a period of dramatic social and economic transitions for China. Consequently, the social and economic environments that parents from different cohorts grew up in also changed dramatically during this period. For example, parents from a younger cohort on average received greater educational investment from their own parents in comparison to the parents from an older cohort (Zhong 2011). Therefore, the negative cohort effect we found suggests that parents who received less intensive educational investment from their own parents in turn invest less on their children's education. This is consistent with the existing literature, which found intergenerational continuity in parenting behaviors (Neppl et al. 2009; Keller et al. 2010). The positive life-course effect we found is also consistent with the existing literature, which has found that parents who had children later in life are less stressed about income and job security and provide more and better educational and emotional support to their children (Leung et al. 2016). However, it is important to note that the life-course effect in our regression analysis was obtained while controlling for parents' income and education levels as well as age. Thus, regardless of which age cohort parents belong to, having a child later in life is associated with greater investment in the child's education even after their socioeconomic characteristics are taken into account.

The dramatic changes in the environments in which the parents in our study grew up may cause a large variation in the way they respond to life-course events. To examine how investment decisions of parents from different cohorts respond to ages at parity, an interaction term of *mother's age* and *mother's age at parity* was added to the baseline specification. The results, which are given in Table 7, show again that regardless of a mother's age cohort, the life-course effect appears to be present and positive, with the probability of no actual effect being 0.001. This suggests that having a child at an older age is strongly associated with an increase in spending on the child's education. Moreover, the negative coefficient estimated for the interaction term means that educational investments of mothers from a younger cohort react more strongly to their ages at parity. Combined with the general upward trend in the age at parity, this suggests that educational investments in children will intensify over time, and the negative effect the delayed age at parity has on fertility through financial channels may strengthen.

Figure 2: Predicted educational expense vs. parents' age at parity

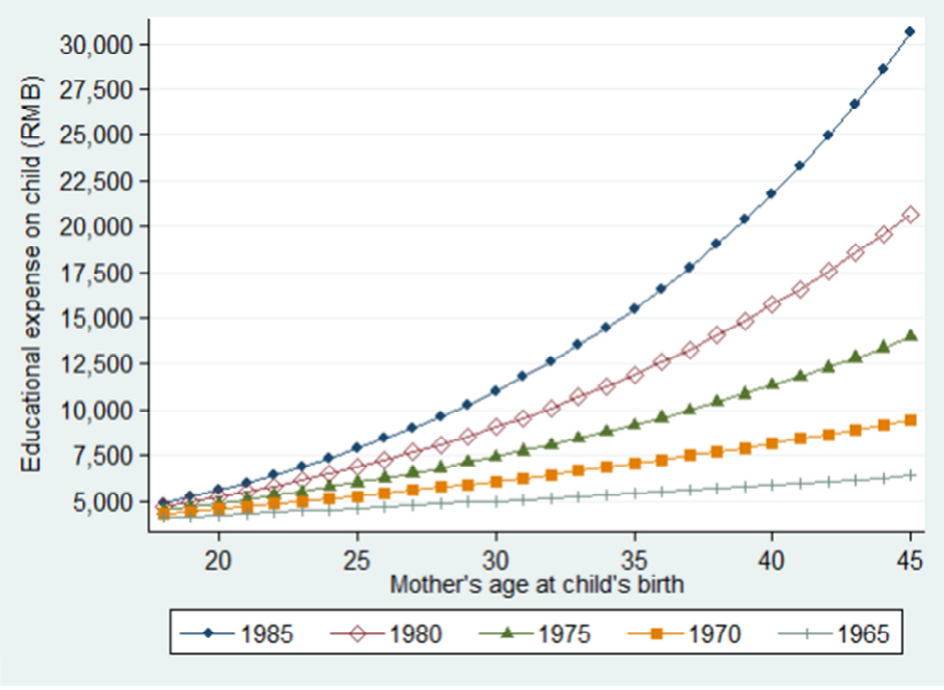


To make our results more concrete, we use the results from Table 6 and Table 7 to graph the predicted educational spending against the age at parity in Figure 2 and against the age at parity by cohorts in Figure 3. Figure 2 shows that at the sample average, where all the control variables other than the parent's age at parity are fixed at their sample average values, the predicted yearly educational spending on a child rises from slightly above 5,200 RMB to around 9,360 RMB, an 80% increase, when a mother's age at parity increases from 21 to 36.[12] A similar pattern is found for the fathers. When a father's age at parity increases from 22 to 39, the predicted educational spending increases from around 5,000 RMB to 9,800 RMB. The life-course effect varies substantially across age cohorts, as implied by Table 7. This is illustrated in Figure 3, which shows that if a woman born in 1970 gives birth at age 36 rather than age 21, her yearly spending on her child's education will increase from slightly under

[12] Ages 21 and 36 were chosen because they represent the 5th and the 95th percentile of the distribution of mother's age at parity in our sample.

5,000 RMB to about 7,300 RMB. In a sharp contrast, if she was born in 1985, she would increase her spending from around 5,900 RMB to nearly 16,600 RMB.

Figure 3: Predicted educational expense vs. mother's age at parity (by age cohort)



Note: 1985, 1980, 1975, 1970, and 1965 refer to the mother's birth year.

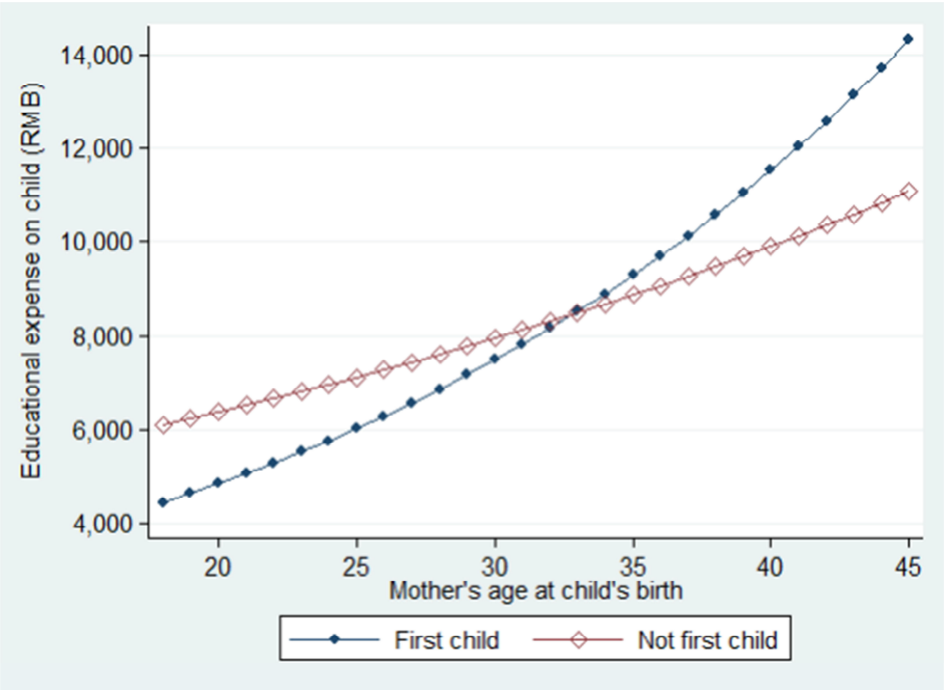
There is a common perception that parents who have children later in life are more likely to be in a stable financial situation, which allows them to invest more in their children. However, our analysis shows that this life-course effect still remains even after accounting for parents' income and wealth. We estimate that parents who have a child one year later in life spend on average 3.81% more on the child's education than those who do not, and the probability of the true effect being zero is less than 0.001. One plausible explanation for the life-course effect that remains is that having a child at an older age is associated with a smaller chance of having additional children in the future, and, as a result, parents may be less financially conservative and more emotionally devoted to the child. If this particular linkage between parents' age at parity

and investments in their children indeed exists, the correlation between a parent's age at parity and the investment in a child's education should be stronger if the child is the firstborn. This is because a parent's age at the birth of the first child is associated not only with a lower probability of having more children in the future (as age at any birth would be) but also with a higher probability of the child being the only child to the parent. Therefore, first-time parents' level of devotion to their children should be more sensitive to their age at parity compared to non-first-time parents.

To test this hypothesis, we added an interaction term of *mother's age at parity* and *not the first child of parent* to the baseline model. The results are given in Table 8 and show that regardless of the child's birth order, having a child at an older age is associated with a higher investment in the child's education. Moreover, as we hypothesized, a mother's investment in a child responds more strongly to her age at the child's birth if the child is a firstborn. As shown in Figure 4, when a woman's age at the birth of her first child increases from 18 to 45, the predicted yearly investment in the child's education increases from around 4,400 RMB to slightly over 14,300 RMB. In contrast, if the child is not a firstborn, then there is a much milder increase, from slightly above 6,000 RMB to around 11,000 RMB. Interestingly, for children born to younger mothers, a non-firstborn child receives more educational investment on average than a firstborn child. However, because delaying parity has a larger effect on investments for the first child than a later child, the two curves cross each other. For mothers giving birth at ages above 33, first-born children on average receive more investments than non-firstborns. Thus, the results provide evidence for the channel we proposed to explain the robust life-course effects on parents' investments in their children's education.[13]

[13] We also examined the effects of parents' age at parity separately for in-school and out-of-school spending. As reported in Tables 10–12, the results are qualitatively the same as the total investment, although the magnitudes are higher for out-of-school spending.

Figure 4: Predicted educational expense vs. mother's age at parity (by birth order)

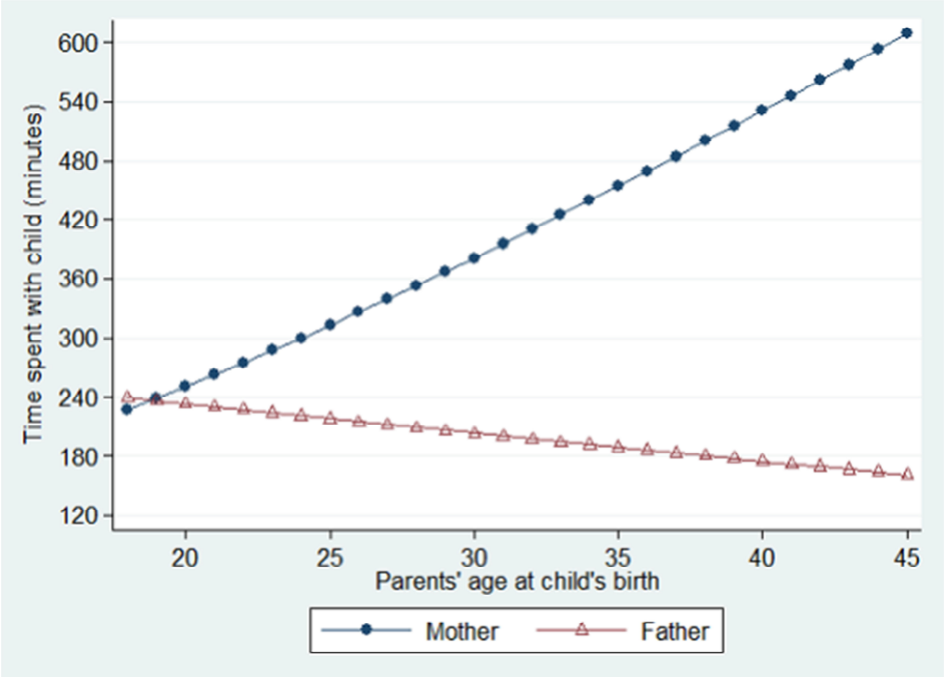


The Tobit estimates of the cohort and the life-course effects on parents' time spent with their children are presented in Table 9. Unlike the effects on educational spending, the cohort and the life-course effects on time spent appear quite different for mothers and fathers. Mothers from older cohorts tend to spend less time with children in comparison to those from younger cohorts. In our sample, mothers from older cohorts are mostly those born in the 1970s, which means they were more likely to have grown up with siblings and have been raised by working parents who had only one day off per week.[14] The continuity theory, which implies that mothers who are raised by busy parents would not devote much time to their own children, may partially explain the negative cohort effect on the time spent with children. Moreover, parents from older cohorts are more likely to work in state-owned enterprises that provide child care services, which reduces the time parents must devote to their children. In addition, as China developed socially and economically, parents may have become more aware of

[14] During this period, China had six work days per week.

the importance of spending time with children in the children's development. These may further explain why mothers from younger cohorts spend significantly more time with their children. In contrast, the cohort effect is positive and much milder for fathers. Moreover, the probability of the effect being actually zero is 0.456. Our results indicate not only that fathers spend less time with their children but also that this situation has not changed much over the period covered by the study. Lastly, the life-course effects are also positive for mothers and negative for fathers. As shown in Figure 5, when all the control variables other than the parent's age at parity are fixed at their sample average values, when a mother's age at parity increases from 21 to 36, the predicted time she spends with her child rises from slightly above 262 minutes per day to around 470 minutes per day, which is a 79% increase. A much milder yet opposite trend is found for the fathers. When a father's age at parity increases from 22 to 39, the predicted time he spends with his child decreases by 22%, from around 227 minutes to 177 minutes per day. Thus, our results suggest that women who had a child at an older age tend to spend more time with their children, but men in a similar situation spend even less time with their children.

Figure 5: Predicted time spent with child vs. parent's age at parity



4. Discussion

This study has examined how a parent's age at parity affects parenting behavior. To the best of our knowledge, this is not only the first study to investigate the effects of parents' age on the educational and time investments in their children in a contemporary Chinese context but also the first that seeks to deepen our understanding of older parents' behaviors by disentangling the cohort effect and the life-course effect. By carefully controlling for the confounding effects, we found a robust negative cohort effect and a positive life-course effect on both educational and time investments. In addition, the life-course effect was found to be more pronounced among parents from a younger cohort.

Over the past several decades, modern societal pressures have resulted in the tendency for couples to delay conception (Kovac et al. 2013). At the same time, biological age constraint on the ability to conceive makes delaying the first birth one of the important contributors to the decline in the total fertility rate in many parts of the world. Our results show that parents who have children later in life tend to invest more heavily in children's education and spend more time with them, which may leave the parents with less financial and time resources for additional children. Thus, our results imply that, in addition to the biological constraint, greater financial and emotional investments associated with older age at parity may be another channel through which delaying parity reduces total fertility. These effects are likely to persist in China even after the official end of the one-child policy. Moreover, since parents from younger cohorts are more responsive to their age at parity, it may result in an accelerating decline in fertility rates.

5. Acknowledgments

We have benefited greatly from discussions with the participants in the 2019 conference Life-Course Decisions of Families in China, held in Chengdu. We are also grateful for the valuable comments from John Giles, as well as the anonymous reviewers. Support from China National Natural Science Foundation grants #71874144 and #71804152, the Fundamental Research Funds for the Central Universities grant #JBK2003016, and China's Ministry of Science and Technology grant #G20190023006 are also gratefully acknowledged.

References

Acemoglu, D. and Pischke, J. (2001). Changes in the wage structure, family income, and children's education. *European Economic Review* 45(4–6): 890–904. doi:10.1016/S0014-2921(01)00115-5.

Allat, P. (1993). Becoming privileged. In: Bates, I. and Riseborough, G. (eds.). *Youth and inequality*. Milton Keynes: Open University Press: 139–159.

Anderson, T. and Kohler, H.P. (2013). Education fever and the East Asian fertility puzzle. *Asian Population Studies* 9(2): 196–215. doi:10.1080/17441730.2013.797293.

Bian, J. (1996). Parental monetary investments in children: A focus on China. *Journal of Family and Economic Issues* 17(1): 113–139. doi:10.1007/BF02265033.

Bourdieu, P. and Passeron, J. (1977). *Reproduction in education, society and culture*. London: Sage.

Brown, P. (2006). Parental education and investment in children's human capital in rural China. *Economic Development and Culture Change* 54(4): 759–789. doi:10.1086/503582.

Carneiro, P. and Heckman, J. (2002). The evidence on credit constraints in post-secondary schooling. T*he Economic Journal* 112(October): 705–734. doi:10.3386/w9055.

Choe, M. and Retherford, R. (2009). The contribution of education to South Korea's fertility decline to 'lowest-low' level. *Asian Population Studies* 5(3): 267–288. doi:10.1080/17441730903351503.

Coall, D., Meier, M., Hertwig, R., Wanke, M., and Hopelinger, F. (2009). Grandparental investment: The influence of reproductive timing and family size. *American Journal of Human Biology* 21: 455–463. doi:10.1002/ajhb.20894.

Elkins, K. (2017). Here's the age at which you'll earn the most in your career [electronic resource]. Englewood Cliffs: CNBC. cnbc.com/2018/11/02/the-age-at-which-youll-earn-the-most-money-in-your-career.html.

Gauthier, A. (2016). Governmental support for families and obstacles to fertility in East Asia and other industrialized regions. In: Rindfuss, R. and Choe, M. (eds.). *Low fertility, institutions, and their policies*. Cham: Springer: 283–303. doi:10.1007/978-3-319-32997-0.

Geiger, A. (2019). 6 facts about U.S. moms. Washington: Pew Research Center. Hamilton, L., Cheng, S., and Powell, B. (2007). Adoptive parents, adaptive parents: Evaluating the importance of biological ties for parental investment. *American Sociological Review* 72(1): 95–116. doi:10.1177/000312240707200105.

Hao, L. and Yeung, W. (2015). Parental spending on school-age children: Structural stratification and parental expectation. *Demography* 52(3): 835–860. doi:10.1007/s13524-015-0386-1.

Jones, G. and Hamid, W. (2016). Singapore's pro-natalist policies: To what extent have they worked? In: Rindfuss, R. and Choe, M. (eds.). *Low fertility, institutions, and their policies*. Cham: Springer: 33–61. doi:10.1007/978-3-319-21482-5.

Keller, H., Borke, J., Chaudhary, N., Lamm, B., and Kleis, A. (2010). Continuity in parenting strategies: A cross-cultural comparison. *Journal of Cross-Cultural Psychology* 41(3): 391–409. doi:10.1177/0022022109359690.

Lappegård, T. (2000). New fertility trends in Norway. *Demographic Research* 2(3). doi:10.4054/DemRes.2000.2.3.

Lee, J. (2008). Sibling size and investment in children's education: An Asian instrument. *Journal of Population Economics* 21: 855–875. doi:10.1007/s00148-006-0124-5.

Leung, M., Groes, F., and Santaeulalia-Llopis, R. (2016). The relationship between age at first birth and mother's lifetime earnings: Evidence from Danish data. *PLOS ONE* 11(1). doi:10.1371/journal.pone.0146989.

Loken, K. (2010). Family income and children's education: Using the Norwegian oil boom as a natural experiment. *Journal of Population Economics* 17: 118–129. doi:10.1016/j.labeco.2009.06.002.

Martens, L., Southerton, D., and Scott, S. (2004). Bringing children (and parents) into the sociology of consumption. *Journal of Consumer Culture* 4(2): 155–182. doi:10.1177/1469540504043680.

Mathews, T. and Hamilton, B. (2016). Mean age of mothers is on the rise: United States, 2000–2014. Hyattsville: National Center for Health Statistics (Data Brief 232).

Neppl, T., Conger, R., Scaramella, L., and Ontai, L. (2009). Intergenerational continuity in parenting behavior: Mediating pathways and child effects. *Developmental Psychology* 45(5): 1241–1256. doi:10.1037/a0014850.

Price, J. (2008). Parent–child quality time: Does birth order matter? *Journal of Human Resource* 43(1): 240–265. doi:10.3368/jhr.43.1.240.

Ryder, N. (1965). The cohort as a concept in the study of social change. *American Sociological Review* 30(6): 843–861. doi:10.2307/2090964.

Sayer, L., Gauthier, A., and Furstenberg, F. (2004). Educational differences in parents' time with children: Cross-national variations. *Journal of Marriage and Family* 66(5): 1152–1169. doi:10.1111/j.0022-2445.2004.00084.x.

Schroeder, C., Spieß, C., and Storck, J. (2015). Private spending on children's education: Low-income families pay relatively more. *DIW Economic Bulletin* 8: 113–123.

Xu, B. and Pak, M. (2019). Child-raising cost and fertility from a contest perspective [forthcoming]. *Public Choice* doi:10.1007/s11127-019-00751-y.

Zhang, Y. (2016). *National college entrance exam in China: Perspectives on education quality and equity*. Singapore: Springer. doi:10.1007/978-981-10-0510-7.

Zhong, X. (2011). Review of the studies on education spending of urban households in China. *Children's Study* 20(1): 2–9.

Appendix

Table A-1: Summary of urban households' educational expenses

Child's grade	Educational expense (RMB)	
	Mean	Std. dev.
Elementary school		
1	11,490	15,842
2	12,769	18,718
3	13,873	19,221
4	13,398	17,670
5	13,214	18,891
6	13,331	18,617
Middle school		
7	15,247	18,716
8	14,674	19,919
9	16,601	23,400
High school		
10	20,044	21,610
11	20,602	21,729
12	24,105	26,527
Number of observations	5,373	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-2: Main characteristics of households and representative children (N = 5,373)

Characteristics	Number of households	Percentage
Household's location		
urban areas of first-tier cities	667	12.42%
urban areas of second-tier cities	1,915	35.64%
urban areas of other cities	2,791	51.94%
Number of children in the household		
1	3,106	57.81%
2	2,007	37.35%
3+	260	4.84%
Parents' highest education level		
lower than high school	2,091	38.92%
high school	1,457	27.12%
college	807	15.02%
bachelor's degree	876	16.30%
master's degree or Ph.D.	142	2.64%
School-stage of representative child		
elementary school	2,919	54.33%
middle school	1,406	26.17%
high school	1,048	19.50%
Birth order of representative child		
first	4,385	81.61%
second	918	17.09%
third and after	70	1.30%
Gender of representative child		
male	2,874	53.49%
female	2,499	46.51%
	Mean	**Std. dev.**
household income (RMB)	101,245	77,517
household wealth (RMB)	1,202,670	1,386,424

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-3: Parents' age cohort and age at parity

Age cohort	**Mother**	**Father**
Cohort	**Percentage**	**Percentage**
before 1970	8.13%	16.32%
1970–1974	24.16%	29.46%
1975–1979	32.66%	31.23%
1980–1984	25.76%	18.65%
1985–1989	8.93%	4.21%
1990 and after	0.36%	0.13%
average age	39.88	42.06
std. dev. of age	5.59	5.97
Age at parity	**Mother**	**Father**
Age group	**Percentage**	**Percentage**
below 25	29.72%	15.52%
25–29	42.81%	40.61%
30–34	19.62%	28.46%
35–39	6.58%	11.24%
40–44	1.05%	3.05%
45 or above	0.22%	1.12%
average age at parity	27.27	29.46
std. dev. of age at parity	4.62	5.15
Number of observations	5,373	5,373

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-4: Educational expenses for child vs. parent's age cohort and age at parity

Age cohort	Educational expense (RMB)			
	Mean	Std. dev.	Mean	Std. dev.
	(vs. mother's age)		(vs. father's age)	
Cohort				
before 1970	13,270	18,874	15,951	21,726
1970-1974	18,305	23,437	18,326	23,029
1975-1979	18,430	22,139	16,503	20,440
1980-1984	12,697	16,553	11,195	14,422
1985-1989	8,447	12,067	7,462	11,808
1990 and after	5,433	7,298	5,309	5,351
Age at parity				
Age group				
below 25	12,834	17,329	10,940	14,851
25-29	17,798	21,937	16,411	20,786
30-34	16,544	21,886	17,098	21,423
35-39	10,666	15,815	15,654	22,284
40 or above	14,524	21,136	13,851	20,179
Number of observations	5,373		5,373	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-5: Time spent with child vs. parent's age cohort and age at parity

Age cohort	Time spent with child (minutes/day)					
	N	Mean	Std. dev.	N	Mean	Std. dev.
		(vs. mother's age)			(vs. father's age)	
Cohort						
before 1970	109	269	305	213	174	241
1970–1974	282	272	306	355	185	238
1975–1979	412	352	336	388	222	257
1980–1984	332	393	359	239	212	253
1985 and after	116	423	397	56	283	297
Age at parity						
Age group						
below 25	378	359	359	175	219	250
25–29	529	339	339	519	203	256
30–34	239	355	341	366	199	246
35–39	88	285	302	129	222	254
40 or above	17	325	322	62	168	241
Number of observations	1,251			1,251		

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-6: OLS estimated effect of parent's age and age at parity on educational expense for child

	Specification 1 (parent refers to mother)		Specification 2 (parent refers to father)	
	Coefficient	**Std. err.**	**Coefficient**	**Std. err.**
parent's age	–0.0323	0.0114	–0.0338	0.0114
parent's age at parity	0.0381	0.0120	0.0404	0.0120
age difference between father and mother	0.0062	0.0060	–0.0001	0.0067
parents with bachelor's or higher degree	0.4654	0.0611	0.4243	0.0572
working parent	0.0684	0.0430	0.1651	0.0619
Characteristics of representative child				
male	–0.1168	0.0387	–0.1160	0.0387
not the first child of parents	0.0757	0.0669	0.0799	0.0668
middle school	0.4057	0.0674	0.4075	0.0674
high school	1.0549	0.0979	1.0664	0.0980
Characteristics of household				
number of children	–0.2603	0.0421	–0.2705	0.0418
ln(income)	0.1279	0.0183	0.1238	0.0184
ln(wealth)	0.1586	0.0128	0.1548	0.0128
first-tier cities	0.7137	0.1239	0.7104	0.1237
second-tier cities	0.2165	0.0475	0.2186	0.0475
province	yes		yes	
Number of observations	5,373		5,373	
Adjusted R^2	0.2209		0.2209	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-7: OLS estimated interaction effect of parent's age and age at parity on educational expense for child

	Coefficient	Std. err.
mother's age	0.0383	0.0193
mother' age at parity	0.1512	0.0276
mother's age * mother's age at parity	–0.0026	0.0006
age difference between father and mother	0.0078	0.0060
mother with bachelor's or higher degree	0.4269	0.0616
working mother	0.0568	0.0430
Characteristics of representative child		
male	–0.1176	0.0386
not the first child of parents	0.0325	0.0674
middle school	0.4023	0.0673
high school	1.0394	0.0978
Characteristics of household		
number of children	–0.2363	0.0423
ln(income)	0.1261	0.0182
ln(wealth)	0.1573	0.0127
first-tier cities	0.6983	0.1237
second-tier cities	0.2124	0.0474
province	yes	
Number of observations	5,373	
Adjusted R^2	0.2237	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-8: OLS estimated interaction effect of parent's age at parity and child's birth order on educational expense for child

	Coefficient	Std. err.
mother's age	–0.0329	0.0114
mother' age at parity	0.0433	0.0123
not the first child of parents	0.6983	0.3298
mother's age at parity * not the first child	–0.0213	0.0110
age difference between father and mother	0.0063	0.0060
mother with bachelor's or higher degree	0.4599	0.0611
working mother	0.0689	0.0429
Characteristics of representative child		
male	–0.1164	0.0387
middle school	0.4053	0.0674
high school	1.0559	0.0979
Characteristics of household		
number of children	–0.2528	0.0422
ln(income)	0.1301	0.0183
ln(wealth)	0.1583	0.0128
first-tier cities	0.7133	0.1239
second-tier cities	0.2153	0.0475
province	yes	
Number of observations	5,373	
Adjusted R^2	0.2213	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-9: Tobit estimated effect of parent's age and age at parity on time spent with child

	Specification 1 (parent refers to mother)		Specification 2 (parent refers to father)	
	Coefficient	**Std. err.**	**Coefficient**	**Std. err.**
parent's age	–21.0378	6.2005	2.7280	5.5438
parent's age at parity	16.5804	6.3996	–4.2775	5.7393
time spouse spent with child	0.4995	0.0398	0.2962	0.0270
age difference between father and mother	–10.0181	3.2048	0.8583	3.2554
parents with bachelor's or higher degree	11.3562	33.7747	15.3100	28.2250
working parent	–100.7440	22.1797	–151.9575	28.1934
Characteristics of representative child				
male	–32.0818	19.9587	–10.0606	17.8636
not the first child of parents	–13.2882	34.4750	–10.7873	36.0617
middle school	9.8783	35.3216	–56.6679	31.5823
high school	–29.9426	52.9313	–112.6187	47.2798
Characteristics of household				
number of children	–1.4202	22.6577	–20.9580	20.2362
ln(income)	1.1363	9.6558	2.4350	8.8173
ln(wealth)	2.2852	6.9048	6.0515	6.1959
first-tier cities	85.6295	100.8956	–30.3182	89.8220
second-tier cities	–26.8172	25.5505	15.8676	22.8092
province	yes		yes	
Number of observations	1,251		1,251	
Pseudo R^2	0.0202		0.0165	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-10: Tobit estimated effect of parent's age and age at parity on in-school and out-of-school educational expense for child

	In-school		Out-of-school	
	Coefficient	**Std. err.**	**Coefficient**	**Std. err.**
mother's age	–0.0236	0.0123	–0.1000	0.0293
mother's age at parity	0.0243	0.0129	0.0880	0.0308
age difference between father and mother	0.0061	0.0064	0.0220	0.0152
mother with bachelor's or higher degree	0.2298	0.0657	0.8910	0.1534
working mother	0.1473	0.0462	–0.0261	0.1089
Characteristics of representative child				
male	–0.0634	0.0415	–0.4383	0.0979
not the first child of parents	0.2162	0.0719	–0.5362	0.1712
middle school	0.5455	0.0724	0.1443	0.1717
high school	1.4030	0.1053	0.2531	0.2505
Characteristics of household				
number of children	–0.1585	0.0452	–0.7538	0.1076
ln(income)	0.0618	0.0196	0.3383	0.0465
ln(wealth)	0.1062	0.0137	0.4236	0.0328
first-tier cities	0.5477	0.1332	1.4555	0.3186
second-tier cities	0.1494	0.0511	0.3859	0.1201
province	yes		yes	
Number of observations	5,373		5,373	
Pseudo R^2	0.0515		0.0387	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-11: Tobit estimated interaction effect of parent's age and age at parity on in-school and out-of-school educational expense for child

	In-school		Out-of-school	
	Coefficient	**Std. err.**	**Coefficient**	**Std. err.**
mother's age	0.0108	0.0208	0.0215	0.0494
mother's age at parity	0.0794	0.0297	0.2833	0.0709
mother's age * mother's age at parity	–0.0013	0.0006	–0.0045	0.0015
age difference between father and mother	0.0068	0.0064	0.0246	0.0152
mother with bachelor's or higher degree	0.2111	0.0663	0.8254	0.1547
working mother	0.1417	0.0462	–0.0449	0.1090
Characteristics of representative child				
male	–0.0638	0.0415	–0.4400	0.0978
not the first child of parents	0.1951	0.0726	–0.6095	0.1726
middle school	0.5438	0.0724	0.1393	0.1715
high school	1.3955	0.1053	0.2279	0.2503
Characteristics of household				
number of children	–0.1467	0.0456	–0.7108	0.1084
ln(income)	0.0609	0.0196	0.3349	0.0464
ln(wealth)	0.1058	0.0137	0.4208	0.0328
first-tier cities	0.5401	0.1332	1.4337	0.3184
second-tier cities	0.1473	0.0510	0.3783	0.1200
province	yes		yes	
Number of observations	5,373		5,373	
Pseudo R^2	0.0517		0.0390	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-12: Tobit estimated interaction effect of parent's at age parity and child's birth order on in-school and out-of-school educational expense for child

	In-school		Out-of-school	
	Coefficient	**Std. err.**	**Coefficient**	**Std. err.**
mother's age	–0.0243	0.0123	–0.0994	0.0293
mother's age at parity	0.0300	0.0132	0.0833	0.0315
not the first child of parents	0.9036	0.3544	–1.1175	0.8485
mother's age at parity * not the first child	–0.0235	0.0118	0.0198	0.0283
age difference between father and mother	0.0062	0.0064	0.0219	0.0152
mother with bachelor's or higher degree	0.2238	0.0657	0.8961	0.1538
working mother	0.1478	0.0461	–0.0263	0.1089
Characteristics of representative child				
male	–0.0630	0.0415	–0.4386	0.0979
middle school	0.5450	0.3544	0.1442	0.1717
high school	1.4042	0.1052	0.2519	0.2505
Characteristics of household				
number of children	–0.1501	0.0454	–0.7607	0.1080
ln(income)	0.0642	0.0197	0.3363	0.0466
ln(wealth)	0.1058	0.0137	0.4239	0.0329
first-tier cities	0.5472	0.1331	1.4558	0.3186
second-tier cities	0.1481	0.0510	0.3872	0.1202
province	yes		yes	
Number of observations	5,373		5,373	
Pseudo R^2	0.0517		0.0387	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-13: Summary of households' educational expenses (urban vs. rural)

Child's grade	Educational expense (RMB)					
	Whole sample		Urban		Rural	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Elementary school						
1	9,124	14,076	11,490	15,842	3,410	4,980
2	10,577	17,031	12,769	18,718	4,462	8,472
3	10,955	16,891	13,873	19,221	4,921	7,601
4	10,437	15,251	13,398	17,670	4,915	6,125
5	9,896	15,818	13,214	18,891	5,050	7,437
6	10,104	15,650	13,331	18,617	4,933	6,251
Middle school						
7	12,216	16,305	15,247	18,716	7,122	9,116
8	11,805	17,174	14,674	19,919	7,091	9,623
9	13,410	20,252	16,601	23,400	6,647	7,233
High school						
10	18,147	19,583	20,044	21,610	12,296	9,066
11	19,115	19,804	20,602	21,729	14,962	12,127
12	21,871	23,768	24,105	26,527	15,807	11,811
Number of observations	8,022		5,373		2,649	

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-14: Main educational expenses (as percentage of total educational expense, urban vs. rural)

Type of educational expense	Percentage of total educational expense		
	Whole sample	Urban	Rural
private tutoring	18.93%	21.09%	8.15%
tuition	17.86%	15.02%	32.03%
supplementary lessons in school	13.08%	14.39%	6.51%
food while attending school	12.19%	9.93%	23.46%
other educational expenses outside school	10.61%	12.11%	3.12%
recreational lessons outside school	6.94%	8.01%	1.60%
recreational lessons in school	3.91%	4.45%	1.21%
purchase of books, supplies, and equipment	3.35%	3.38%	3.22%
accommodations	1.82%	1.38%	4.01%
Number of observations	8,022	5,373	2,649

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.

Table A-15: Parents' age cohort and age at parity

Age cohort	**Mother**	**Father**
Cohort	**Percentage**	**Percentage**
before 1970	8.13%	16.32%
1971–1974	24.16%	29.46%
1975–1979	32.66%	31.23%
1980–1984	25.76%	18.65%
1985–1989	8.93%	4.21%
1990 and after	0.36%	0.13%
Age at parity	**Mother**	**Father**
Age group	**Percentage**	**Percentage**
below 25	29.72%	15.52%
25–29	42.81%	40.61%
30–34	19.62%	28.46%
35–39	6.58%	11.24%
40–44	1.05%	3.05%
45 and above	0.22%	1.12%
	Average age at parity	**Average age at parity**
	Std. dev.	**Std. dev.**
	27.27	29.46
Number of observations	5,373	5,373

Source: Authors' analysis of the 2017 Chinese Household Finance Survey.